A.D. 1866, *24th December.* N° 3394.

Generating Electricity.

(*This Invention received Provisional Protection only.*)

PROVISIONAL SPECIFICATION left by Cornelius Varley and Samuel Alfred Varley at the Office of the Commissioners of Patents, with their Petition, on the 24th December 1866.

I, Cornelius Varley, of 337, Kentish Town Road, in the County of Middlesex, and Samuel Alfred Varley, of 66, Roman Road, Holloway, in the said County of Middlesex, Telegraph Engineers and Contractors, do hereby declare the nature of the said Invention for "Improvements in the Means and Apparatus for Generating Electricity," to be as follows:—

Our Invention consists in an improved method of developing electricity, either by mechanical force alone, or by mechanical force in combination with chemical action.

We construct our apparatus as follows:—We wrap soft iron bars with insulated wire in a similar way to an ordinary electro-magnet; these bars may be made U-shaped, and become electro-magnets when the apparatus is in use; we also construct iron bobbins of such a length that they will pass just freely between the poles of the electro-magnets and wrap them with insulated wire.

In constructing the apparatus we prefer generally to use two electro-magnets and two bobbins; the bobbins are mounted on an axle and revolve between the poles of the electro-magnets, and are so arranged on the axle that when one of the bobbins is between the poles of one of the electro-magnets the other bobbin is between the poles of the other, and vice versa. On the axle carrying the bobbins there is a commutator, the ends of the insulated wire surrounding the bobbins are connected to this commutator, and through it to the insulated wire of the electro-magnets, forming the whole into one electric circuit. Before using the apparatus we generally send an electric current through the electro-magnets; the object of this is to secure a small amount of permanent magnetism in the direction we wish in the soft iron cores of the electro-magnets. On revolving the axle the bobbins become slightly magnetized in their passage between the poles of the permanent magnets, and as the electro-magnets are so arranged that the north pole of the one magnet is opposite the south pole of the other the bobbins are magnetised first in one direction and then in the other, generating weak currents (corresponding to the direction in which the bobbins are magnetized) in the insulated wire surrounding them. The commutator changes the connections of the electro-magnets at the same time as the magnetism of the bobbins is reversed, and consequently the electric currents developed in the bobbins always flow in one direction through the insulated wire of the electro-magnets. The effect of the current passing through the electro-magnets is to increase their magnetism and to magnetize in a higher degree the bobbins when passing between the poles of the electro-magnets; more powerful currents are now developed in the insulated wire surrounding the bobbins, which in their turn induce a higher degree of the magnetism in the electro-magnets; in this way the magnetism developed on the electro-magnets and the bobbins act and react on one another, causing the circulation of increasing quantities of electricity.

In constructing this apparatus to prolong the contact between the bobbins and the poles of the electro-magnets we generally arm the poles of the electro-magnets or the bobbins with horns of soft iron. We call this apparatus a magnetic multiplier. In some cases we use only one iron bobbin and make it oscillate between the poles of two electro-magnets; this we do by mounting the bobbin on a lever to which motion is communicated by means of an eccentric or crank, or by any other suitable way.

When we want currents of a definite amount of force for ringing electric bells, or for working other telegraph apparatus, we prefer to use permanent magnets, which we construct in the following way:—We take a number of bar magnets and make a compound horse-shoe magnet by arranging two sets of them over one another; we connect the north poles of the one set with the south poles of the other at one end by means of plates of iron placed between the magnets, and we prevent the magnets from touching those beneath them at the other end by means of small pieces of iron of the same thickness as the plates connecting the north and south poles of the magnets at the other extremity. The bar magnets are now bolted together, a bobbin made of iron and wrapped with insulated wire is mounted on a lever, and works between the poles of the compound magnet. On removing the bobbin from between the poles of the compound magnet a current is developed in the act of demagnetization. To prolong the duration of this current be construct two of these compound magnets and arrange the north pole of the one opposite the south pole of the other; the iron bobbin now after passing from between the poles of the one magnet passes between the poles of the other, and a current of a longer duration is generated. The magnetic multiplier may be used in conjunction with a galvanic battery, the effect of which is to bring it into action more quickly.

When we use batteries we prefer constructing them in separate cells, which we arrange in groups, each group is placed in an acid eight trough, and a small hole is pierced through the bottom of each cell, so that when the exciting fluid or acid is poured into the troughs it flows into the cells.

When useing the magnetic multiplier we sometimes complete the circuit with a large electro-magnet which may be placed near the machine; this acts as a sort of reservoir or fly wheel to the machine, making the currents more constant.

LONDON:
Printed by George Edward Eyre and William Spottiswoode,
Printers to the Queen's most Excellent Majesty. 1867.